

(b) dissolving the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in step (a) in water and treating with activated carbon, which activated carbon is then separated off, followed by precipitating out phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt by adding sodium chloride and separating off, and

(c) dissolving the product of step (b) in water and sodium hydroxide solution, followed by treating with activated carbon, which activated carbon is separated off,

(d) acidifying the filtrate to precipitate out phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt substantially free of by-products which would cause discoloration of phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt, and

(e) optionally further purifying the product of step (d).

10. A process as in claim 3, wherein step (a) is carried out at a temperature of from 110°C to 120°C.

**REMARKS**

Review and reconsideration of the Office Action of December 2, 2002, is respectfully requested in view of the above amendments and the following remarks.

Applicants respectfully submit that Claim 3 (twice amended) more clearly and precisely defines the present invention.

That is, once amended Claim 3 as presented in the Amendment filed September 12, 2002, was produced by the literal incorporation of original Claim 1 and Claim 2 into Claim 3. The resulting once amended Claim 3 was difficult to follow. Further, although the process recited in Claim 3 was argued to inherently produce a phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt substantially **free of by-products which would cause discoloration** of phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt, this inherent feature was not explicitly recited in Claim 3 and thus may have been (properly) disregarded by the Examiner.

In view of the above, Claim 3 has been carefully revised to be easier to follow, and to expressly recite the feature which was merely inherent in the previous Claim 3. Support for amended Claim 3 can be found, in addition to the original claims, at page 3, second paragraph, and at page 4, third paragraph.

Although addition of a new claim after a final rejection is discretionary with the Examiner, Applicants respectfully request entry of Claim 10, reciting reaction temperature limits, in response to the Examiner's position that applicants are increasing yield by modifying temperature. Thus, entry of claim 10 is requested to significantly advance the examination of the present application.

Accordingly, review and reconsideration is respectfully requested.

Turning now to the Office Action, under paragraph 7 the Examiner rejects all claims as presented for examination as obvious over Pelzer et al, and further in view of Wang et al and further in view of Heywang et al.

Applicants respectfully traverse in view of the present amendment of the claims.

The Examiner indicates that Pelzer et al teach a process for producing phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt by a process comprising process step (a) and a portion of process step (b) of twice amended Claim 3, and that it would be obvious to conduct experimentation in order to find a way to further improve yield, particularly "upon detecting incomplete reaction".

Applicants respectfully traverse. The Examiner is presuming that the object of the invention is to improve yield. This is not the object of the invention, nor is it the result of the inventive process.

As described in the Field of the Invention, the present invention concerns a process for producing phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt which is **largely free from impurities**.

As discussed at page 1 of the specification, process are known wherein this salt can be produced with high yield (99% by weight). However, as discussed at the top of page 2 of the specification, the product prepared in accordance with the known process **leads to unacceptable discolorations of the**

**formulations.** It is thus the object of the invention to provide a phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt which **does not contain any discoloring components.**

As discussed at the bottom of page 2 and the top of page 7, by conducting the process according to the invention, the only byproducts are those which are safe and cause **no discoloration** of the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt.

Turning to the Examiner's grounds for rejection, the Examiner considers that yield can be improved by changing reaction time or reaction temperature.

However, since the present invention concerns producing a phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt **free of impurities which can cause discoloration,** it would follow that increasing reaction temperature or increasing reaction time would **increase** rather than decrease discoloration causing impurities - there would tend to be more side reactions, condensations, polymerizations, decomposition or other subsequent reaction of the product (especially at elevated temperatures). It is thus surprising that in the present invention the result is not poorer, as might be expected, but rather is surprisingly better.

It is further apparent that the present invention does not concern improving the Pelzer yield of 99% to something greater than 99% by somehow reducing the 1% impurity of Pelzer. In

fact, the yield of Example 1 was 98% - thus impurity was 2% - twice that of Pelzer.

Even if it were presumed that one wanted to prevent discoloration - it would not be obvious that a process which resulted in an increase in impurities would result in less discoloration!

The Examiner writes that "one of ordinary skill in the art routinely adjusts . . . the parameters of time and temperature during the optimization of the process. These limitations cannot, in the absence of a surprising result, confer patentability."

Well - the surprising result is that the modified process removes discoloring components! Thus, the results are not merely different in **amount**, they are different in **kind**! The prior art does not teach how to remove discoloring components.

The present invention not being obvious over the primary reference, the secondary references do not remedy the defects of the primary reference.

Wang teaches a different compound that behaves differently when compared to a tetrasulfonated compound of the present invention (and the Examiner agrees). Although both compounds belong to the class of sulfonates, their physical properties (solubility in water and/or organics, crystallization behavior, etc.) are quite distinct from each other. Thus, if one were to attempt to improve purity (not the aspect of the present

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invention) or even if one were to seek to solve the discoloration problem, one would not resort to Wang.

Turning to Heywang, this reference also teaches a different compound, as acknowledged by the Examiner. This is particularly relevant to acidification to pH 3. The monosulfonate of Heywang shows different solubilities and crystallization/purification behavior from the present tetrasulfonate compound.

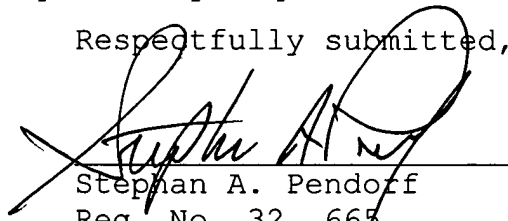
In conclusion, it is the combination of steps in twice amended claim 3 that ensures that the discoloring components are removed from the tetrasulfonate product in a way that is sufficient to avoid discoloration of formulations. Since these products are used as ingredients in cosmetics, it is readily apparent that the tendency to discolor cosmetics renders the products of the prior art process (Pelzer) of little value, while the product of the present invention - free of discoloring impurities - are significantly more valuable. This difference in property is not obvious over the teaching of the prior art.

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Accordingly, withdrawal of the rejection and early issuance of the Notice of Allowance is respectfully requested.

Respectfully submitted,

  
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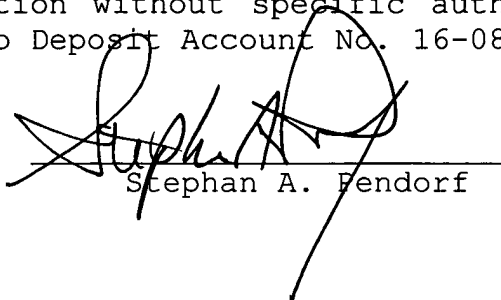
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Dated: **March 3, 2003**

**CERTIFICATE OF MAILING AND AUTHORIZATION TO CHARGE**

I hereby certify that the foregoing AMENDMENT B for U.S. Application No. 09/995,328 filed November 27, 2001, was deposited in first class U.S. mail, postage prepaid, addressed: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on **March 3, 2003**.

The Commissioner is hereby authorized to charge any additional fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account No. 16-0877.

  
Stephan A. Pendorf

**VERSION WITH MARKINGS TO SHOW CHANGES MADE HEREBY ATTACHED**

The Examiner is requested to accept the marked-up version as it is based on the previous version, which when modified as below, produces the clean version submitted with the current amendment.

**IN THE CLAIMS:**

3. A process for the preparation of phenylene-bis-benzimidazole-tetrasulfonic acid di-sodium salt substantially free of discoloration causing by-products comprising:

(a) reacting o-phenylene-diamine with terephthalic acid and chlorosulfonic acid in the presence of strong acids, wherein the reaction time is 10 to 15 hours,

(b) dissolving the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in step (a) in water and treating with activated carbon, which activated carbon is then separated off, followed by precipitating out phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt by adding sodium chloride and separating off, and

(c) dissolving the product of step (b) in water and sodium hydroxide solution, followed by treating with activated carbon, which activated carbon is separated off,

(d) acidifying the filtrate to precipitate out phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt substantially



free of by-products which would cause discoloration of phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt, and

(e) optionally further purifying the product of step (d)

[comprising the step of reacting o-phenylene-diamine with terephthalic acid and chlorosulfonic acid in the presence of strong acids, wherein the reaction time is 10 to 15 hours and wherein the phenylene-bis-benzimidazole-tetrasulfonic acid obtained in the reaction is, in a first step, dissolved in water and treated with activated carbon, which is then separated off, and where the phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt is precipitated out by adding sodium chloride and separated off and, in a second step, is again dissolved in water and again treated with activated carbon, which is then again separated off, where pure phenylene-bis-benzimidazole-tetrasulfonic acid disodium salt precipitates out of the filtrate by acidification and is then optionally also purified].

Please add the following new claim:

--10. A process as in claim 3, wherein step (a) is carried out at a temperature of from 110°C to 120°C.--